SERENDIPITY

(PERCEPTUAL)

AN APTITUDE FOR PERCEIVING PLEASANT DISCOVERIES ON AN ACCIDENTAL BASIS

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*A design thesis project presented to Ryerson University
in partial fulfillment of the requirements for
the degree of Master of Architecture
in the Program of
The Department of Architectural Science*

*Toronto, Ontario, Canada, 2017
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— this is not reality.

Perceptual Serendipity (REVISIT)

In order to properly observe and critique the perceptual process from an unbiased perspective, one must first remove oneself from the notion of experience and look inward. The topics discussed within this body of work will present a series of discrete investigations that will serve as allegorical simulations of direct perceptual experience, and its relationship with the design process.

The scan, as an armature for 'seeing', offers a way to conceptualize spaces and forms in terms of saturation and density; very much akin to peripheral vision. This allows us to dismantle the dominance of privileged form and to focus on the notion of perception through simulated experience. Conceptually, this is perhaps more in tune with our spatial perception within the fidelity of natural environments (Umwelten), in which our focal points and lines of reference naturally degrade, in favour of heightened peripheral awareness.

"Meticulous layering and accretion of material and meaning upon a long and extended conversation of time, space, motion, geometry and fabrication talks of high definition as a theoretical assemblage of spatialised imaginings."

Bob Sheil AD (2014)

Acknowledgments

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PERCEPTUAL

An aptitude for perceiving pleasant discoveries on an accidental basis.

1.0 INTRODUCTION

1.1 Perceptual Serendipity

Serendipity, or serendipitous behaviour, is described as the aptitude for perceiving pleasant discoveries on an accidental basis. While not an incredibly new concept to design and its related process, serendipitous discovery within the perceptual process of design is an incredibly potent catalyst for the concepts being explored within this thesis. As an introspective exercise, observing this serendipitous behaviour allows us to take a step back and apprehend new discoveries as we wade through the many aliases induced through simulated perception.

As a result, we can observe how these discoveries impact the way we perceive our surroundings as a whole. Now in order to properly observe and critique the perceptual process from an unbiased perspective, we must first remove ourselves from the notion of experience and look inward.

The perceptual process within tectonic and spatial understanding is a fleeting experience to apprehend. This process, the concept of cognitive model-making and real-time generation is holistically serendipitous by nature. The idea of serendipitous discovery *through* this experience is not an extraordinarily new concept to design and its related process, but it becomes a metaphorical vehicle for us to observe the cognitive components themselves.

These serendipitous discoveries as stand-alone models, albeit fluid through firsthand experience, become key for the investigative process in which one can begin to understand the drivers for the models we make of our environment.

1.2 Allegorical Simulations

In order to properly observe and critique aspects of the perceptual process from an unbiased perspective, one must first remove oneself from the notion of experience and look inward. The topics discussed within this body of work will present a series of discrete investigations that will serve as *allegorical simulations* of direct perceptual experience, and its relationship with the design process.

At its core, an allegory is an extended metaphor; a metaphor in which simulated objects, environments, participants, and actions participate in a narrative. These components in

turn become equated with meanings that lie outside of the narrative itself, and personify the abstract ideas that they convey.

For example, the digital scan, as an allegorical armature for 'seeing' offers a way to conceptualize spaces and forms in terms of saturation and density; very much akin to peripheral vision. This also allows us to dismantle the dominance of privileged form and to focus on the notion of perception through simulated experience. Conceptually, this is perhaps more in tune with our spatial perception within the fidelity of natural environments (Umwelten), in which our focal points and lines of reference naturally degrade, in favour of heightened peripheral awareness.

1.3 Re-Discovery

The topics discussed within this body of work will present a series of discrete investigations that will serve as allegorical simulations of direct perceptual experience. It will also explore the relationship between these experiences within the design process as a result of our ongoing dialog with the simulations themselves.

For the sake of our simulations, we will utilize this landscape as our perceptual environment. What is important to note moving forward is that this environment, as we peel its aliases apart within our various simulations, becomes our site. The idea of the site however, will be observed from the perspective of its *image* as the site for our discoveries. The utilization of the image as a site is a concept thoroughly explored by Archigram's Michael Webb, in works such as *The Journey*. Webb uses his imagery *derived* from observing the environment as his site for discovery through introspective activity.

In Webb's most recent re-visitation of *The Journey*, the foveal cone is preserved as a distilled object within the field of purview, and separated from what he calls the Landschaft. As an exercise, Webb allows for the notion of the air within the cone to solidify, thus being removed from the overall Landschaft and investigated independently. As such, the image of the cone becomes the site for the self entitled *Journey* that is used as a source of dialog for the course of his project. While utilizing *this* current Landschaft as our own, we use its high definition or visual fidelity as a cue for our initial percept.

Reserved (Conclusion on how this process will overall heighten our understanding of the perceptual process and encourage embracing serendipitous behavior.) There is a re-discovery portion here that is important to discuss due to the merit of observing our behavior. It offers us access to reasons why we may exclude or include certain data when observing the environment, especially when fidelity is considered as a driving factor.

2.0 THE VISUAL FIELD

2.1 Fovea

The discussion surrounding the traditional field of vision is an interesting dialog that begins to unfold the concepts of perception, a phenomenon that **our simulations aim to interpret**. In terms of optometry, the foveal system of the human eye is the only part of the retina that permits one hundred percent visual acuity. In correlation, the line-of-sight is a virtual line that connects the fovea with a fixation point in the participant's environment. The discovery of the line-of-sight is attributed to Leonardo da Vinci, who derived his insights through optical modelling, and more importantly through exercises of *introspection*.

Latin for *pitfall*, the fovea is a small, central depression composed of photoreceptor cells that sends approximately half of all information through the optic nerve. In essence, the fovea is responsible for sharp central vision, which operates for the purpose of absorbing direct visual information. There are many works that document the basics of the fovea, or 'visual cone' dating back to the studies of da Vinci, who is accredited for providing the modern distinction between foveal and peripheral vision. In a similar thread, the work of Archigram founding member Michael Webb gives us access to an introductory discussion on the visual cone as an 'ice core', casting ambiguous virtual shadows and providing a site for what Webb describes as *The Journey*. (Webb) This project is a perfect example of discovery through introspective activity, and allows us access to certain perceptive models only achievable through such introspective exercises.

The Journey is an ongoing discussion and project that begins with the concept of capture. Traditionally, the concept of 'capturing' a scene close to oneself would be through some sort of alchemy; the author or photographer persuasively flattens on a two-dimensional surface a yet unperceived, and quite possibly fugitive according to Webb, essence of the three-dimensional subject. To capture however, is also to take possession of through the 'grokking' of it that drawing brings. (Webb)

(Author's note, can use this opportunity to provide an 'aside' definition of grokking. This word was invented by Robert A Heinlein, also known as the 'dean of science fiction'. It appears in the book *Stranger in a Strange Land*, Putnam Publishing Group, (Kirkwood, NY), 1961. The Oxford English Dictionary definition is 'to understand intuitively or by empathy; establish rapport with'.)

The landscape in question that occupies *The Journey* is that of the regatta course at Henley-on-Thames, and more particularly, the volume of air, land and water enclosed by a perspectival cone of vision whose axis is parallel to the plane of the river and whose apex is the 'Cyclopean eye of the beholder'. As an exercise, Webb allows for the notion of the air within the cone to solidify, and can thus be removed from the overall landscape and investigated independently; akin to the 'ice core' concept as mentioned previous. As such, the cone becomes the site for the self entitled *Journey* that is used as a source of dialog for the course of the project.

Although the accompanying images are physically drawn, they simulate the depiction of a single camera lens; only objects within this purview may be featured within the drawing. What

lies behind the objects however, are negative 'shadows' that radiate from the camera lens. Webb describes them as 'voids slashing through the ice-core sky, water and ground'. Were the camera to be moved however, these voids would begin to rotate, and create new gashes within the surface of the cone. As an investigation, Webb entices that is one were to locate oneself within this 'mobile caesurae', it would present an 'evanescent spatial experience'. (Webb)

(Author's note, more here to research on the Temple Island work by Webb. The imagery and ideas are akin to the concept of the fovea and more of the exercises serve as metaphors for traversing a digital/immaterial landscape).

2.2 Scotoma

A scotoma (from the Greek *skótos* or *darkness*) is an area of partial alteration in the field of vision consisting of partially diminished or entirely degenerated visual acuity. This area, can be entirely or partially surrounded by a field of normal or relatively well preserved vision. The mechanical makeup of every mammal's visual system includes some form of a scotoma, due to the location of the optic disc. The optic disc is a small area of the eye where no photoreceptor cells exist, due to the optic nerve leaving the retina. What is important to understand is the scotoma's relationship with the field of vision; there is no conscious awareness of visual scotomas, as they are simply regions of reduced information *within* the visual field. For example, rather than recognizing an incomplete image before the participant, participants report that objects within the visual field "disappear" on them. (Fletcher et al.) Whilst being a natural component to a healthy visual system, a scotoma can also be a symptom of damage. Retinal damage can have many causes, most notably in the form of macular degeneration, brain damage, or exposure to severe light sources. (Figure from national eye institute).

More notably, the term scotoma is also used in a metaphorical manner in several other fields. The common theme that derives all of the figurative senses is a gap not in visual function, but in the mind's perception or cognition of the environment. There is however, a very strong connection to the literal sense of the term which succinctly lays out the foundation for our simulated exercises. This connection, between the nervous system and the mind, originates from both a literal and metaphorical tangent through sensory input, nerve conduction, and to the **overarching architecture of the system** (in the case of a human, the brain). The processing and interpretation of said input leads to perception, via the brain-mind correlation to psychological function. As such, there can be not only (or most importantly, not *necessarily*) a visual inability to see an aspect of the environment. Instead, there may be a mental inability to conceive even the possibility of seeing that aspect, due to a cognitive schema that lacks any provision for it. A very simple example of this 'lack of schema' could be described by the example of hemispatial neglect; a neuropsychological condition often observed when damage is sustained to one hemisphere of the brain, causing a deficit in attention to and awareness of a portion of the field of vision. (Unsworth) As an example, a stroke affecting the right lobe of the brain can result in neglect for the left side of the visual field. This leads to outright neglect of the left side of sensory space, regardless of the fact that the affected person can still physically turn their system left. Although the most striking effects

occur in the form of visual perception, neglect in other forms of perception can be found either alone or in combination with its visual component. (Guiseppe)

(Author's note, can use this opportunity to provide an 'aside' definition of hemispatial neglect and provide a number of examples ie plate of food, clock drawing or limb neglect.)

Neglect not only affects present sensation, but memory and recall perception as well. A participant experiencing neglect may also, when asked to recall a memory of a certain object and then replicate said object may only draw half of the object. What may be important to note however, is the cause may be unclear. This may be due to the fact that there is a perceptive deficit of the memory (loss of spatial information of the memory). In contrast, the memory of the object's entirety may be fully intact, but the presence of such memory may simply be ignored.

Discussing the varieties of neglect may prove to be a strong metaphor for the simulated process of perceptual serendipity. No single mechanism can account for these different heterogeneous manifestations, and a vast array of impaired mechanisms are found within it. (D'Esposito) The complexity of attention in itself, which is only one of many mechanisms that may interact with one another, has generated an array of competing explanations on the subject itself. Regardless of the difficulty to assign certain scenarios, one can still loosely describe 'unilateral neglect' within four major overlapping variables; **type, range, axis, and orientation**. All four of these groups refer mostly to the physical properties of the participant's environment. For example, range would refer to objects close or far from the participant, whereas the axis is simply horizontal or vertical neglect, as well as every angle in between.

What is extremely important to discuss however, are the various theories surrounding neglect as a disorder of spatial attention, or spatial representation. (Bradshaw) Spatial attention is the process where objects in one location are chosen for processing over objects in various other locations. (D'Esposito) This definition would imply that neglect in and of itself is more intentional, which is strongly due to the fact that the participant has an affinity to direct attention to the unaffected side of the environment. (Mesulam) The theory itself suggests that neglect is seen as a disorder of attention and orientation caused by disruption of the visual processor. Participants with this disorder will direct movements and attention to the unaffected side, and neglect stimuli within the environment's affected opposite despite having preserved visual fields. The result of this combination is an increased sensitivity of visual performance in the unaffected side of the environment. (Brandt et al.)

Spatial representation however, is the way space is represented within the brain. This particular theory outlines the belief that the underlying cause of neglect is the inability to form representations of the space on the affected side of the environment. (D'Esposito) As a result, participants demonstrate a failure to describe the affected side of a holistically familiar environment, from any given point drawn from memory. As a detailed example, two well-cited studies have been used to demonstrate neglect as a component of spatial representation. The first, evidence drawn from Bisiach and Luzzatti's study of the Piazza del Duomo in Milan showcases memory-related neglect of a familiar environment. Participants within the study who

demonstrate hemispatial neglect, and were also entirely familiar with the layout of the Piazza del Duomo square were observed. The participants were then asked to imagine themselves at specific vantage points within the square, without physically being present. As an exercise, they were then asked to describe varying landmarks around the square, such as architectural features, materials, shops, etc. At each specific vantage point, the participants consistently described landmarks only on the right side, and exclusively neglected the left side of the representation.

The key factor to the study however, was that their multiple descriptions of different vantage points showcased the fact that the participants had knowledge and reserved spatial information of the entire square. Consequentially, they could only identify the right side representation of each particular vantage point. When the participants were asked to change vantage points so that the environmental information overlapped with the unaffected hemisphere, they were finally able to describe the details within the environment that they previously neglected. (Bisiach)

Similar patterns can be found with comparing physical visual stimuli to imaging processed in the brain. (Rossetti et al.) A participant who was confirmed to have knowledge of the map of France in its entirety, was asked to name French towns on a physical map, as well as their mental image of it. The map, both mentally and physically was then rotated 180 degrees. As a result of the mental exercise, from memory, the participant was able to name Eastern towns within the country at first, while naming Western ones after the 180 degree rotation. This was because the Western portion of the map was now in the 'Eastern' (right) section of the mental environment or represented mental field after rotation. This means that the actual neglect stayed consistent with the mental image. However, with the physical copy of the map, the participant's focus stayed exclusively with the Eastern towns of France, regardless of physical orientation.

This particular study leads researchers to believe that neglect for images drawn from memory may be disassociated from the neglect of stimuli generated from the extrapersonal environment. (D'Esposito) In this case, the participant showed no loss of memory, concluding that their neglect was a form of deteriorated spatial representation. In essence, spatial representation here can be described as the reconstruction of spatial frames in which the spatial relationship of objects that may be perceived, imagined or remembered, with respect to the subject are organized and acted correctly on.

In conclusion, the concept of scotoma and neglect, are seemingly 'dark' portions that exists both mentally and mechanically within the foveal cone. These pockets of visual acuity dissolve due to mechanical imperfections of the system, but are by no means cast aside to be literally neglected for the sake of our simulation, as their metaphorical concept can be quite intriguing for the purpose of our work.

(Author's note, can use this opportunity to provide an 'aside' example of 'scintillating scotoma' as a correlation to the concept of an alias or degraded sampling.)

2.3 Periphery

Finish thoughts on neglect varieties and fill out section with peripheral discussion. This will be followed up by the islands of vision project. The concept here is to develop a basic knowledge of the different sections of the visual field (Foveal cone, shadows within the cone, and the outlying peripheral areas outside of the cone.)

2.4 Perception

At its highest level, the visual field is described as the spatial array of visual sensations available to observation. This observation in particular, deals directly with psychological discussions surrounding introspection. Within the realm of psychology, the process of introspection itself relies exclusively on the observation of one's mental state. Consequently, the idea closely relates to human self-reflection, which starkly contrasts to external observation.

Introspection as a mental activity generally provides a privileged access to our own mental state, unmediated by other sources of knowledge. (Seager) This provides a unique and individual experience for each mental activity, which allows us to determine any number of mental states including sensory, cognitive, bodily and so forth.

"...why should we not calmly and patiently review our own thoughts, and thoroughly examine and see what these appearances in us really are?"

Plato

Introspection as a **simulated** exercise becomes crucial to our initial thoughts on a higher level of perception and its role on how we begin to observe the process itself. Perception, by definition, is the organization, identification, and interpretation of sensory information in order to represent and understand the presented information, or the environment. (Schacter) All perception involves signalling; an ongoing barrage of information that passes through a nervous system. (Goldstein) As an example, vision involves light striking the retina of the eye, but for the purposes of our allegory, the nervous system can become purely mechanical, and our simulations give us access to the simulated 'mental state'.

Perception is by no means simply the passive receipt of these signals, but it is also shaped by the recipient's cognitive models and model-making ability. At its core, perception can be dichotomized into two processes; the first, being the process of sensory input. This transforms low-level information to higher-level information for further use by the participant. An example could simply be extracting shape data for object recognition or referral. The second process however becomes much more referential. The process itself is directly connected to a person's concepts or expectations (knowledge) and the selective mechanisms (attention) that influence the perception itself. (Bernstein) There are many psychological layers to the concept of perception, but in real time the act of perceiving seems subjectively effortless, because it's important to note that the processing happens outside of conscious awareness. (Goldstein 5-7) This is crucial to our simulations due to the fact that we can consciously interact with the

processing stage itself, and actively make design or discovery-based decisions as the processing stage evolves.

What is important to the discussion are two fields of discourse in particular that will contribute to the dialogue of our studies. On one hand, perceptual systems can be studied computationally, in terms of the information they process and the way that they interact with our cognitive models. Along a similar vein, perceptual dialogue revolving around philosophical issues include the extent to which sensory qualities exist in objective reality rather than the mind of the perceiver. (Gregory) This is an important discussion with regards to the concept of simulating the perceptual process because the study of illusionary or ambiguous imagery has demonstrated that the brain's perceptual systems actively and pre-consciously attempt to make sense of their input. (Gregory) As such, the perceptual systems of the brain enable the participant to see their environment (Umwelt) as stable, regardless of the fact that the sensory information is typically **incomplete** or rapidly varying.

From a computational perspective, the human brain is structured as a modular network, where different areas process different kinds of sensory information. What is important to discuss however, is that some of these modules take the form of sensory maps, mapping certain aspects of the environment across part of the brain's surface. (DeVere) As a result, these modules are interconnected and influence one another during the process of structuring the process of perception.

The process of perception, begins with an external object, known as the *distal stimulus* or *distal object*. (Goldstein) By means of a physical or simulated process, the object stimulates the sensory mechanisms, and transforms the input energy into (in the case of a human) neural activity. This process is known as *transduction*, with the raw neural activity being the *proximal stimulus*. (Pomerantz) The neural signals themselves are transmitted to the brain for mapping, and the resulting mental re-construction of the distal stimulus is what Goldstein coins as the *percept*.

As a brief example, **Figure** shows an image of a tree. The tree itself is the *distal stimulus*. When light rebounds from the tree and enters the optic receptor, the resulting stimulation would therefore be the *proximal stimulus*. Finally, the reconstructed image of the tree by the brain, or simulated counterpart, would be the *percept*. Stimuli are not necessarily translated into a percept and rarely does a single stimulus translate into one. An ambiguous stimulus (with varying degrees of ambiguity) may be translated into multiple percepts, experienced randomly and exclusive of each other, in what is called **multistable perception**. This perceptual phenomena is described as a set of unpredictable sequences of spontaneous subjective changes. (Eagleman) Perceptual multistability can be evoked by visual patterns that are relatively ambiguous for the visual system to recognize with one unique interpretation. As an example, **Figure** shows an object wrapped around the previous tree, which will be our new percept. The form of the object is created in such a way for our perceptual simulation to experience a varying degree of this 'multistability'. In stereo vision, such as the human eye, the object should be able to be discerned at various angles and depths, which fold to and from the

participant. However, in monocular simulation (such as a photograph of the object) the elimination of our depth perception causes multistable perception to take over, causing the folding object to invert certain depth values in the reconstruction. This example of an ambiguous figure demonstrates that a single stimulus can result in more than one percept, and the percept can bind sensations from multiple senses into a whole.

(Author's note, can use this opportunity to provide an 'aside' example of a photograph of moon craters, where photographs may make the craters seem like plateaus as a more 'real world' example of this phenomena). Can also look into the suggested Deleuze, Guattari and Levin readings.

2.5 Visual Perception

The notion of fidelity also plays a major part in the way we compose and illustrate our designs as an assemblage of perception. As Kate Davies writes, "images mediate our understanding of the world, conjuring powerfully convincing secondary narratives that can serve to reveal truth, obscure it, or reinvent it entirely." The images or 'sites' we observe in our simulations, will become crucial interactions with the way we discuss their outcomes or aliases.

The process of perception begins with an external object, known as the distal stimulus or distal object. By means of physical or simulated process, the object stimulates the sensory mechanisms, and transforms the input energy into (in the case of a human) neural activity. The neural signals themselves are transmitted to the brain for mapping, and the resulting mental reconstruction of the distal stimulus is what is known as the *percept*.

Our distal object will give us access to multiple sites through serendipitous discovery and the following reconstructed percepts. This discovery will come via multiple simulations and the layering of their digital secretion.

The concept of high definition, and using fidelity as a cue, gives us access to what Sheil notes as a theoretical assemblage of spatialised imaginings. Through the assemblage of new aliases and percepts, we can step back and observe the process of perception.

As an object within the space, the distal object has relatively low depth, but interacts with the environment through shadow and reflection, sometimes blooming to a degree in which it blends in with the sky. The tool in which we are using has also rendered the object textureless, providing some views with obscene glare, and assigning the object a colour fairly foreign to its context. As an early simulation, we can discuss the idea of architectural representation in its traditional form of two-dimensional imagery, both perspectival and orthographical.

If we were to represent this object as it rests within the site, traditionally we would provide a series of two-dimensional images consisting of necessary views. This in turn generates a collection of imagery that attempts to foster our perception of the object in its entirety. With regards to our exercise however, this simply isn't enough information to simulate

a perceptual experience. This concept of insufficient information, while usually erroneous in our classic understanding of perceiving space, become the valleys to our metaphorical peaks when making discoveries within our sites.

This image presents an early example of this concept put to work. A physical model of the distal object resting on a blue quilt was digitized. The tool used to digitise the object was given 2d information traditional to our understanding of classic representation, and as a result only fragments of the object were re-constructed.

Small islands of visual acuity are drawn out from the information provided to the simulation, and as a result of filling in the gaps, we view a new perceptual understanding of the object, or percept.

The design of the actual object and its relationship within the fidelity of the environment however are crucial to observe during the process of re-cognition. As such, we begin to achieve observations in the realm of re-cognition through the act of re-conceptualization. These simulations act on rebuilding cognitive models, or preconceived notions of how the environment is perceived and interpreted.

Visual perception, in its literal form, is the ability to interpret the surrounding environment using light within the visual spectrum.

- Important to note that in the case of the flea example through Ux's work (Umvelt), the spectrum for perceptual intuition may not be referencing the visual spectrum. In this case, heat mapping.

Early studies of Visual Perception

- Two major Greek schools of thought, providing the first primitive explanations of how vision is carried out in particular to the human mechanical system.
- The first being 'emission theory', based on rays emanating from the visual system. An object was only seen due to these particular rays falling onto the object. A refracted image was seen from these rays as well, where emanating from the eyes, transverse the environment, and after refraction fell onto the object. (Euclid)
- The second school advocated for the so called 'intro-mission' approach which vision as coming from something entering the eyes representative of the object.
- Both of these schools relied on the principle that "like is only known by like", but both purported that light was what made vision possible.

Unconscious interference.

- Hermann von Helmholtz is often credited with the first study of visual perception in the modern age (following da Vinci).
- A couple of important notes, the first being that examination of the human eye concluded that optically it was rather poor.
- The poor-quality information gathered from the eye seemed (at least to Helmholtz) that this alone would make vision impossible.

- The main conclusion here was that vision could only be the result of some form of unconscious interference; a matter of making assumptions and conclusions from incomplete data, based on previous experiences. (Helmholtz) Inference therefore, requires prior experience of the world. The study of visual illusions has yielded much insight into what sort of assumptions the visual system may make.

2.6 Cognition

A couple important discussions here to introduce the idea of 'model making'.

- Gestalt Theory, or 'laws of organization'.
- The analysis of 'eye' movement. (Discussion here is with regards to the human eye, but opens up dialogue as to how a purely simulated system would treat this idea.
- Vergence movement (cooperation of both eyes so object falls within both retina)
- Saccadic movement (rapidly jumping to certain positions to scan the scene)
- Pursuit movement (smooth movement used to follow objects in motion)

The conversation here could discuss certain simulation techniques in order to discover different perspectives, perhaps using bifocal image processing in the photogrammetric phase of the simulations as an example.

3.0 SIGNAL PROCESSING

3.1 Pre-Aliasing (Sampling)

Samples are not created, but simply made visible to the filter. Concept of the filter being a passive or active mechanism. (Revealed)

Signal processing.

Complete or partial **suppression** of some aspect of the signal.

- linear/non-linear
- time-invariant/time-variant
- causal/not-causal
- analog/digital
- discrete-time/continuous-time
- passive or active types of continuous-time filter
- infinite impulse response/finite impulse response types of discrete-time/digital

If you were to zoom in on a polygon (Super-zoom/Super-sample), how does that relate to the data that's being sampled? Is it simply being disregarded?

In one sense no, because its born from it, but in the example of the super-zoom, it's completely disregarded because it simply isn't visible. Which begs the next question. If something simply isn't visible, does it matter?

What even defines 'visibility' in the eye of the mind? Is this how artistic works are interpreted?

In signal processing, **sampling** is the reduction of a continuous signal to a discrete signal. A common example is the conversion of a sound wave (a continuous signal) to a sequence of samples (a discrete-time signal).

A **sample** is a value or set of values at a point in time and/or space.

A **sampler** is a subsystem or operation that extracts samples from a continuous signal.

A theoretical **ideal sampler** produces samples equivalent to the instantaneous value of the continuous signal at the desired points.

CONCLUSION: In image generation through sampling of data, an alias is shown in conjunction with the original frequency, creating peaks and valleys.

Anti- would be the **interpretation** of the sampled data. IE algorithms used to interpret the space between samples.

- **IS MY PROECT CONSIDERED ANTI_ALIASING?**

3.2 Aliasing

Spatial aliasing through sampled signals.

In signal processing and related disciplines, **aliasing** is an effect that causes different signals to become indistinguishable (or *aliases* of one another) when sampled. It also refers to the distortion or **artifact** that results when the signal reconstructed from **samples** is different from the original continuous signal.

Aliasing can occur in spatially sampled signals (through time), for instance digital images. Aliasing in spatially sampled signals is called **spatial aliasing**. Simply put, alisaing is digital imprecision generated in the process of converting analog information into digital space due to the limited granularity of digital numbering space.

When a digital image is viewed, a reconstruction is performed by a display, as well as the **eyes in conjunction with the brain**. If the image data is not properly processed during sampling or reconstruction, the reconstructed image will differ from the digital image, and an alias is seen.

An example of spatial aliasing is the moiré pattern one can observe in a poorly pixelized image of a brick wall. Spatial anti-aliasing techniques avoid such poor pixelizations.

Aliasing can be caused either by the **sampling stage or the reconstruction stage**; these may be distinguished by calling sampling aliasing *prealiasing* and reconstruction aliasing *postaliasing*.

3.3 Filter

What is the organization of the filter, recalling the act of collecting samples. Concept of the perceptual filter. Optical filtering; Placed in the optical path to selectively transmit light of different wavelengths. Two types of wavelengths, absorptive and interference (dichroic) filters. (Absorption and reflection). Discussion may turn to the eyes/brain for perceptive filtering. Is the filter left on its own to choose what is absorbed or reflected, or is the filter a tool with set parameters. When the baseline is set, the simulation gives birth to anomalies. This questions whether or not this (refer to figure) is a failed experiment in a sense that anomalies didn't exist, or is this exercise an anomaly of the rules imposed. What then becomes the value of these moments frozen and distilled?

Photographic filtering, is sometimes used to make subtle changes to images; other times it would not be possible to create the image without them. Filter could become an ontological mechanic bringing artefacts into being. (Created, visible, culled). Filter may also be considered an environment, a way how we might perceive and misperceive the world.

What will become the filter

- does the filter become the perceptual experience?
- does the filter make visible the perceptual experience?
- does the filter drive the perceptual experience?
- does the filter reveal the perceptual experience?
- does the filter distill the perceptual experience?
- does the filter reconstruct the perceptual experience?

Ideas on the perceptual thought process, perceptual construction, and finally perceptual space. Regarding the scan, it becomes a filter/shadow for the eye.

3.4 Error

Mathew Shaw 'The Surface Error Series' compounds the slight errors implicit in the scanning process and shows the distortion, mistruth and beauty that repeated error can create. A base SLS printed target is repeatedly scanned, 3d printed and re-scanned for 12 iterations. This micro test of distortion could be applied on a city scale, altering its digital appearance.

A digital artefact is any **undesired** alteration in data introduced in a digital process by an involved technique and/or technology. Coming back to the idea of Ghery, when

creating digital artifacts during digital reconstruction, at what point do these alterations become undesirable, and at what cost? Can these alterations become harnessed?

Visual artifacts are anomalies during visual representation of e.g. digital graphics and imagery. similarly, an anomaly is a deviation from the common rule, type, arrangement or form. An incongruity, or inconsistency.

Many conversions between continuous and discrete representations may occur in the course of generating an image. For example, when ray tracing a texture-mapped surface, a photograph may be sampled by a digitizer to define the texture, then the texture samples are interpolated and resampled when a ray strikes the textured surface, the ray samples are interpolated and resampled to generate pixel values, and the pixels are interpolated by a display and finally resampled by retinal cells when the image is viewed. Resampling may be more explicit, as in enlarging or reducing a digital image or warping an image (e.g., with Catmull and Smith's algorithm). Each of these conversions can introduce conspicuous errors into an image.

What defines an 'error'. It is only an error insofar as it doesn't completely replicate the analog.

3.5 Reconstruction

Reconstruction can be responsible for aliasing and other types of distortion that mar the **subjective quality** of an image. Focus here (SOURCE) is the subjective quality. Aliasing is always spoken in terms of rectifying distortion due to the sampling process. What if this is used instead as a design driver.

3.6 Digital Secretion

This discussion falls in line with the Bob Sheil writings, discussing the idea that the constant layering of data may produce new findings. A simple example would be the Mathew Shaw project regarding the multiple scanning of one landscap

4.0 SIMULATION №1

4.1 Umwelt

Environment, in the sense of our simulation is taken as a higher level concept that makes reference to the experiments of Jacob von Uexkull. In essence, the discussion will introduce the definitions of Site, Environment, Scene etc.

4.2 Visual Fidelity

4.3 Recognition

5.1 Reference will play a major role in the discussion surrounding the fidelity of the scene. This plays into the layout of the various percept within the environment, and how it anchors the viewer within it. Reference here is used as a baseline, or a site in which to begin the drilling or jamming process.

5.2 Light Detection and Ranging Technology (LiDAR)

LiDAR-jamming “stealth objects”, envisioning a future in which cities are subject to the constant scrutiny of LiDAR scans. Shaw and Trossell devised hypothetical devices for deceiving the lasers and distorting what they recorded. A speculative tool called the “stealth drill” was meant to dissolve scan data, “creating voids and new openings in the scanned urban landscape.” A “boundary miscommunication device” would trick scans into registering paths, tunnels and walls that didn’t exist.

- Explores the city from stealth locations.

FIDELITY BECOMES A CUE.

THE WAY THE COMPOSITION INTERACTS WITH THE PERIPHERAL
PRESERVATION? AMPLIFICATION?
COMPOSED.

- Breeding actual 3D scans with speculative LiDAR blooms, blockages, holes and drains.
- Strategically deployed devices which offset, copy, paste, erase and tangle LiDAR data around them.
- Shows the route of 'stealth drills' carving our LiDAR data.
- Deployment of flash architecture and toolpaths of stealth mechanics.

5.3 Cognitive jamming is crucial to outline for Simulation Number 2 as it provides a 'natural' allegory for the way we can view our interaction with the site. What follows will be the discussion regarding 'The Black be' exercise as it illustrates the influence the drill has on the site. What is important to note is that it does not matter if the object is in frame or not, it becomes a drill for the landscape. Scan also becomes the drill for representing the alias of an architectural object. Understanding becomes experiential, an alias is drawn for the object to take shape based on the imaging sequence. Due to its thin, sharp nature, it becomes hard to immediately interpret depth, existing almost as a shadow of the analog. This is perhaps why we are drawn to intricate, or even organic objects, as they are not readily grasped or understood even in full view.

- Does this mean we need thousands of images to even begin to understand/ What is the bare minimum?
- Does this not prove what we already know? Perceiving an object based on current forms of representation (orthogonal views) is inferior.

What is interesting is that we need traditional forms of representation for the program to create depth, context, light, shadow, etc. All of these things need to be present in order for the perceived object to even BEGIN to take form. Even after the introduction of traditional representative methods, the alias could not be drawn or recognized due to the lack of information. Perhaps it becomes possible for the composition of the image to provide a reference point. Out-of-focus images with no contextual background won't even be judged by the program, yet what is created from a pseudo-complete understanding is an alias, attempted parts due to misjudged data.

- Composition as reference.

Concept of the quilt, the skin became so intricate that it couldn't be referenced properly. Due to its thin nature, it becomes hard to interpret depth, exists almost as a shadow of the analog. Maybe this is why people are drawn to intricate, organic objects. Not exactly grasped or understood even in full view.

As a precedent example, Lidar-jamming "stealth objects", envisioning a future in which cities are subject to the constant scrutiny of Lidar scans. Shaw and Trossell devised hypothetical devices for deceiving the lasers and distorting what they recorded. A speculative tool called the "stealth drill" was meant to dissolve scan data, "creating voids and new openings in the scanned urban landscape." A "boundary miscommunication device" would trick scans into registering paths, tunnels and walls that didn't exist.

In conclusion, we come back to the concept of serendipitous discovery through critique of the simulation. Through serendipitous exploration, a conceptual tool is born, an alias-assist, or in the words of Mathew Shaw, a *stealth drill*. The drill in the case of our simulations becomes a referential object that catalyses serendipitous discovery, allowing for bifurcations in the simulated perceptual process to allow us to critique them. It becomes a speculative tool meant to dissolve scan data, and mar the sampling process pre and post aliasing.

Simulation №3

Seeing Photogrammetry Peripheral Reconstruction

6.0

6.1

6.2

6.3

Narration exercise; Simulation Number 3. Initial notes.

- Simulation Number 3 discusses the concept of discovering new modes of vision, as well as putting them to use.
- The context of definition (high and low) should be discerned in order to provide a context for our 'site'.
- The discussion of seeing can be drawn out to include an introduction based on the previous section regarding vision. (This will set a context for how our new mode of vision can be explained).
- In addition, 6.1 will include the discussion of the scan. Keep in mind, Simulation Number Two deals with jamming this mode of vision, strongly consider reversing the order of these two sections in order to maintain continuity. The trouble here is 5.1 (Reference) builds off of 4.0 (Environment Recognition) as an action involving our site.
- Can delve more into the theory of Rene Magritte if need be, this may provide concepts involving seeing/building conceptual models before it is appropriated with language, an idea that these simulations are founded on.
- 'Uniqueness' can be described as a term, and can be co-opted as an idea that also shows up in Michael Webb's discussions of the site.
- Ideas of 'The Image' cited from Walter Benjamin, *The Work of Art in the Age of Mechanical Reproduction*.
- Strongly consider the discussion of the painting (Reference) to be also used in 5.1.
- Still need to insert a few references. These include Mathew Shaw (*Subverting the LiDAR Landscape*), ScanLAB (*London's Mad Machine Hallucinations*), ScanLAB (*Stealth Objects and Scanning Mist*).

6.1 Surrealist painter Rene Magritte is widely acknowledged for their commentary on the always-present gap between words and seeing, mainly stemming from their work on *The Key of Dreams*. Seeing always comes before words, and evolves into a very complex system

involving cognitive discovery. We never look at just one thing; we are always looking at the relation between things and ourselves. Our vision is continually active, continually moving, continually holding things in a circle around itself, constituting what is present to us as we are.

Soon after we can see, we are aware that we can also be seen. The eye of the other combines with our own eye to make it fully credible that we are part of the visible world. Every image embodies a way of seeing. Even a photograph. For photographs are not, as is often assumed, a mechanical record. Every time we look at a photograph, we are aware however slightly, of the photographer selecting that sight from an infinity of other possible sights. The photographer's 'way of seeing' is reconstituted by his choice of subject. (Berger) Soviet film director Dziga Vertov eloquently describes this awareness as an existential exercise;

I'm an eye. A mechanical eye. I, the machine, show you a world the way only I can see it. I free myself for today and forever from human immobility. I'm in constant movement. I approach and pull away from objects, I creep under them. I move alongside a running horse's mouth, I fall and rise with the falling and rising bodies. This is I, the machine, manoeuvring in the chaotic movements, recording one movement after another in the most complex combinations.

Freed from the boundaries of time and space, I co-ordinate any and all points of the universe, wherever I want them to be. My way leads towards the creation of a fresh perception of the world. Thus I explain in a new way the world unknown to you. (Vertov)

In essence, what Vertov is describing is the concept that the visible, in continual flux, becomes fugitive. To further illustrate this concept, we can look to the 'uniqueness' of a painting. The uniqueness of every painting was once part of the uniqueness of the place where it resided. Sometimes the painting was transportable, but it could never be seen in two places at the same time. When the camera reproduces a painting, it destroys the uniqueness of the image. As a result its meaning changes. Or, more exactly, its meaning multiplies and fragments into many meanings. (Berger) This is essentially illustrated by what happens when a painting is shown on a television screen. The painting enters each viewer's house. There it is surrounded by its wallpaper, their furniture, their mementos. It enters the atmosphere of the family. It becomes their talking point. It lends its meaning to their meaning. In other words, the mechanical redistribution of the image diversifies its original meaning. The original of the reproduction; its first meaning is no longer to be found in what it says, but what it is.

Consequently a reproduction, as well as making its own references to the image of its original, becomes itself the reference point for other images. The meaning of an image is changed according to what one sees immediately beside it or what comes immediately after it. Such authority as it retains, is distributed over the whole context in which it appears. (Benjamin) This concept plays a very strong part in the way we view the simulations, as one of our major modes of vision is provided by 'the scan'.

The scan provides entirely new understanding and engagement with the complexities of context, form, behavior and volume that heretofore have been unattainable, crudely

approximated or poorly grasped. (Webb) What is important to note within the context of similar technologies, is that the scan is often related to a level of fidelity that approaches reality. The tangible has caught up with the intangible. The focal point for advanced technologies in architectural design has shifted from the outer edges of the virtual to a position of hybridity with the actual. The tool range has made a profound leap in definition and fidelity, and tolerance is explored across conditions of fine-grain information. Engaging with the difference between the simulated and what is seen, the images born from our simulations provide us with congruent sites that offer a new cognitive perspective born from the opposing end of the fidelity spectrum.

In 1928 Walter Benjamin stated that the limits of photography 'cannot yet be predicted'. Everything to do with it at the time was still such a new process that even initial exploration proved to yield strikingly creative results. In his work, he noted that technical expertise would obviously become the tool of the pioneer in the field. The illiterates of the future will be the people who know nothing of photography rather than those who are ignorant of the art of writing. (Benjamin) The scan, as an armature for seeing, illustrates this concept in the context of our simulations. The concept of discovery driven by the fidelity of the tool and its environments become our observatory. As put by Kate Davies, images mediate our understanding of the world, conjuring powerfully convincing secondary narratives that can serve to reveal truth, obscure it, or reinvent it entirely. (Davies) This becomes the crux of our findings regarding the scan.

The scan itself is an inspiring mode of vision, as it focuses on everything at once and nothing in particular. Representation and abstraction; dealing less with human experience or the reality of the material in its rich heterogeneity and subjection to external forces. (Webb) It offers a way to think about spaces and forms more in terms of saturation and density, similar to peripheral vision, which deals less with form than the fovea. Much like the dense natural environment, losing focal points and lines of reference.

- Fidelity becomes a cue for the filter.
- The way the composition interacts with the peripheral object.
- Creating an object that could reference, or be referenced by the landscape.
- The concept of an alias-assist, or an alias with an agenda.
- Referential object to object or object to environment.

Figures 6.11 through 6.14 offer an example of this concept. The scan offers a vision that is void of natural prejudice. Our investigation however is to dissect the site that is now offered to us, and view it from an unbiased perspective. Various scans of the same physical model portray organization and partial filtration of the object, in a manner that is seemingly undefined and varied in multiple instances.

- Expand on relevance. What can be drawn from here is that we have varying degrees of reconstructed fidelity based on the same simulation. Even though the model is seemingly based in our reality, one can argue that from an allegorical perspective it is

FIGURE 6.11

FIGURE 6.12

FIGURE 6.13

FIGURE 6.14

not our own. There are forces at work that were discussed in sections prior, offering us insight into a new mode of vision.

- Peter Eisenman 'The digital has the capacity to produce inconsistent multiples, and what it ends up producing, is consistent multiples'.

6.2 Simulation Number 3 begins to evolve at this point through another perceptual process, simulated in the form of photogrammetric scanning. Photogrammetry is the science of deriving measurements from photography, offering another layer of reconstruction provided by the concept of the scan. In essence, the simulation will use a collection of photographs used to calculate geometry and depth.

- Capturing and layering graphic fidelity.
- 'Meticulous layering and accretion of material and meaning upon a long and extended conversation of time, space, motion, geometry and fabrication talks of high definition as a theoretical assemblage of spatialised imaginings. Not about blending in, but about losing reference and exploration.
- Importance in the alias may come from the depth of the scan, the shadow or what becomes unseen.
- **The video game 'site' needs to be introduced. This may be another strong indicator that Simulation 2 and 3 need to be swapped.**
- Figure 6.21 and 6.22 further the photogrammetric investigation of the game engine environment.

The scan, as an armature for 'seeing' offers a way to conceptualize spaces and forms in terms of saturation and density; very much akin to peripheral vision. This allows us to dismantle the dominance of privileged form and to focus on the notion of perception through simulated experience.

Conceptually, this is perhaps more in tune with our spatial perception within the fidelity of natural environments or 'Umvelten', in which our focal points and lines of reference naturally degrade, in favour of heightened peripheral awareness.

Now with regards to the discussion of fidelity, or most often pooled into the concept of 'high definition', this is where we can access the notion of an assemblage as Sheil discussed prior. By designing our distal object in such a way that it converses with the fidelity of the image, we can view its effect on how the environment is perceived.

Here we are introduced to the crux of most of our larger simulations; the scan. There are many mathematical and spatial methods of scanning that currently offer us access to a formerly unseen realm of perceptual experience, but for the purposes of this simulation however, a more metaphorical approach has been taken.

Photogrammetric scanning is a method that utilizes two dimensional data to generate spatial understanding and contextual depth. It captures data from our most traditional form of representation and filters it with accurate graphic fidelity layer upon layer.

pg 20160330024337_1.jpg 20160330024339_1.jpg 20160330024342_1.jpg 20160330024345_1.jpg 20160330024348_1.jpg 20160330024351_1.jpg 20160330024354_1.jpg 20160330024357_1.jpg 20160330024402_1.jpg 20160330024406_1.jpg 20160330024410_1.jpg

20160330024536_1.jpg

0024533_1.jpg

20160330024531_1.jpg

20160330024528_1.jpg

024

20160330024508_11.jpg

024421_1.jpg

030024417_1.jpg

030024415_1.jpg

030024412_1.jpg

60330024409_1.jpg

20160330

__20160330024504_1.jpg

FIGURE 6.21

FIGURE 6.22

Here we have a dense point cloud of over 7.6 million points of coloured data. As an inspiring mode of perceptual vision, one can now begin to witness a form of spatial aliasing; akin to our sub-sampling and processing of experience with the composition of the image before us. The object itself begins to break down as certain aspects of its form are sampled and interpreted. In terms of experiential data, the object in its entirety is the focus of the dataset, even still struggling with the stability of its reconstruction.

However, when the object is moved to the periphery of the data, the aliasing process begins to dissolve the object entirely, displacing foliage and shadow of the phantom-object. The data filter is now actively sampling what it defines as visibility in the eyes of the mind.

What is also interesting to understand is the access our simulations give us to its own cognitive model-making process, some of which would have gone undiscovered. Here we see tie points indicating from a single image, what the simulation understood as important referential moments while conversing with other image data during the reconstruction process.

The points in blue indicate environmental references that match those of another image from a different viewport, while the white points were simply cataloged for consideration. As a result we can begin to break down our understanding of how the distal object or drill as effecting the way the new cognitive models are created.

This becomes an extremely important cue for image composition, as no perceptual experience is similar or static. Aliases and reconstructions of the architectural object become experiential and unique, offering different modes of perception. Akin to an assemblage of sketches, traditional methods of representation involving depth, context, light, shadow, form, all need to be present in order for the perceived object to even *begin* to take form.

As Kate Davies writes, "the sketch becomes the initial ghost, more of a sense of feeling. The sketch is the closest we get to the fragility and beauty of an imaginative thought."

As such, our simulations and the images generated from their cognitive re-building process offer us sites for our sketches of discovery.

6.3 Peripheral reconstruction will become the component to which major discoveries are made, and further acted upon. We will be able to observe the simulated process of construction through the combination of the scan, and simulated information-gathering of the photogrammetric study.

Simulation №4

Re-cognition

Cognitive Model Making

Serendipitous Perception

7.0
7.1
7.2
7.3

Narration exercise; Simulation Number 4. Initial notes.

- Idea of designing on a cognitive model, the image (or perhaps the conceptual model) may provide us a site for designing.
- Define 'cognitive model' for the purpose of the simulation.
- Re-cognition through re-conceptualization. The word play should be very strong in this section to showcase the fluidity of our simulated process.
- "A concept is a generalization or abstraction from experience or the result of a transformation of existing ideas." *Merril & Tennyson*
- "Cognition is the mental action or process of acquiring knowledge through thought, experience and the senses. At its basic level, cognition uses existing conceptual models while simultaneously generating new ones." *Oxford*
- Always considering how John would approach a critique. "That is simply the algorithm to which the pixels are approximated between data." (Figure example).
- Site, simulation and scene may start to confuse the reader. Might be beneficial to discern/identify each with discrete descriptions.

7.1 The purpose of Simulation №4 is to culminate various aspects of our simulated experiences to provide us with its own cognitive model. Based on previous recognition models generated by the layering of simulations, we begin to see the growth of a new model. Certain conditions and outcomes can be examined within the site, providing us new insight into the way we can interpret a brand new perception. As a very rudimentary example, Figure 1.1 shows a minor recreation of the visual field with the use of panoramic algorithms. The purpose of the simulation here is to see how the reconstruction is effected by our initial percept. Initially, we can see that the drill is ghosted in certain areas of the scene, offering us initial insight on how certain aspects of the visual field are being interpreted by the simulation. This could quite possibly be an example of initial cognitive jamming caused by the drill, offering insight as to what cognitive components of the scene are being related or referenced in the field of vision.

- Figure 1.2 overlays two data sets that become important in the dissecting of how the original scene is interpreted by the simulation. Point-cloud data is superimposed onto tie-point data made visible by the photogrammetric exercise.
- Photogrammetric data, in itself, becomes a very insightful indication as to which parts of the scene are prioritized over others. This data indicates common points of interest that

FIGURE 1.1

FIGURE 1.2

will be used in the reconstruction of the scene, and will eventually provide us a new cognitive model for our design.

7.2 From this information, we can begin to discern new models of vision and begin to ask certain questions as to why some elements of the scene are prioritized over others. There are very clear indicators visible to the model, showcasing how visual fidelity of the scene draws the vision of the simulation to certain percepts for reconstruction.

The drill in this case however, seems to avert the gaze of the simulation in this particular site. The initial investigation begs a few questions as to how the drill plays a part within the fidelity of the environment. As an example, the object may be too ambiguous for the filter to deem aspects of it sufficient for the recreation of the site, which may further cause layering and alteration of it within the simulated process.

- Figure 1.4 an initial image to introduce the idea of anamorphic projection as a serendipitous simulation, mostly in the form of altering the FOV of the model.
- Densities of the point cloud system can also offer insight as to how much information is easily gathered or neglected when reconstructing the cognitive model.
- With ambiguous percepts (in this case the drill) noticeable 'explosions' of point cloud density are made visible after interpretation.
- These densities contribute to an assigned map of the texture mesh, offering information into the ordering and relative system the simulation employs to correlate certain textures.
- Figure 1.5 is a close up of said mapping, showing the relationships between prioritized meshes and how the data in between the more detailed components of the reconstruction is interpreted.

Figure 1.3 is the initial reaction of how cognitive model making, or the emerging cognitive models serve as a site to engage with the simulation, or perhaps evolve the design based on serendipitous mappings. The topography mapping shows relationships between the density of tie-points, only one of the few cognitive processes we have begun to engage with.

- Here we have an opportunity to expand on the idea of mapping cognitive simulations, and how we can act on them as a site for design.

These discussions can expand on the cognitive model-making process, and can discern bifurcating moments in the simulation process.

FIGURE 1.4

FIGURE 1.5

FIGURE 1.3